The
# Florida Entomologist
(Formerly The Florida Buggist)
Official Organ of the Florida Entomological Society

VOL. IV SUMMER NUMBER NO. 1
JULY, 1920

## THE MOSQUITO-MALARIA PROBLEM IN FLORIDA*

C. F. HODGE,
Extension Professor of Biology, University of Florida.

My extension work during the year has taken me from Pensacola to Miami and over a number of circuits in the northern and central sections of the state. In all of my trips a study of this problem has occupied a good share of my spare time; and I have come unexpectedly to one conclusion which greatly simplifies the solution of the mosquito problem. As an observer who accompanied me on one of my excursions expressed it: "We have been thinking and looking at the big places and have entirely overlooked the little places in which all of our mosquitoes really breed." A rain barrel, a green pool by the watering trough in the barnyard, or a pile of tin cans may not amount to the proverbial "drop in the bucket" compared to the nearby lake, marsh or cypress swamp, and still all the mosquitoes that infest the farm home, the village or town may be breeding in the former places.

Take a few typical cases. At Stuart I found at the rear of a

*Given before the June meeting of the Florida Entomological Society.

restaurant in the heart of the town a battered sheet iron wash tub, evidently used in its last stages as a garbage receptacle. It was about half full of filthy water. There were scores of mosquito egg-rafts on the surface and the water was alive with larvae and pupae. Mosquitoes were numerous, and there were probably many other similar breeding places, but enough mosquitoes were breeding in that one tub to supply the town. None were found breeding in any of the natural waters.

In Plant City, on the freight station platform, were seven barrels of water, all supplied with eggs and alive with wrigglers in all stages. They were pouring mosquitoes by the thousands into the business center of the city. The septic tank on the outskirts of the city was also found breeding mosquitoes, literally, I think, by the millions. This is a problem for the city engineer. No breeding whatever was found in ditches or bay heads during a number of examinations extending from March through the first half of May.

Dade City furnishes an especially instructive example. Near the A. C. L. depot are extensive water-lily ponds that look from the distance utterly hopeless. Careful examination, however, along their marshy borders, in the worst looking places, revealed only top minnows everywhere and no mosquitoes breeding whatever. Mosquitoes were breeding abundantly in tin cans and rubbish of a large dump alongside of one of these ponds.

The worst night I had during the whole year was spent in a room of a hotel in Haines City. There were inside screens supposed to cover the lower half of the windows, but both lower sashes were immovably stuck about half way up. This left two cracks the width of each window thru which all mosquitoes attracted to the windows could pour into the room. I spent the entire night killing the pests and estimated the casualties roughly at between four and five thousand. In the morning I determined to find out where those mosquitoes were breeding. Diagonally across the street from the hotel was the railroad station and on the freight platform, as usual, were barrels of water, five in this instance. One of these had oil on it. The other four were covered with a solid scum of mosquito eggs and empty pupa cases, and hundreds of mosquitoes could be seen in the act of emerging from the water. The capacity of one of these barrels, I should think, might be 200,000 mosquitoes every ten days. I was told, as usual in such cases, that those barrels didn't amount to anything compared with the numbers that were breeding in the lake.

Again careful examination of the most likely places along the lake shores revealed only schools of minnows and other natural enemies and no mosquito larvae. A boat drawn up to the shore with some water in it showed one or two rafts of eggs and a few young wrigglers. If left a few weeks it might become a breeding place.

I might give many more illustrations that prove the same point. Of course being a stranger and spending, usually, only one day in a place, it was impossible to make a systematic examination of all the backyards, henyards and barnyards of a town; but I have found in most towns the water barrels on the freight platforms breeding enough mosquitoes to make life a burden to the entire community.

Bringing the matter home to us here, mosquitoes, both Anopheles and Culex, are now numerous on the University campus. A recent survey, while not as yet complete, certainly adds evidence to support the position above advanced. At the meter box north of Buckman Hall, where the water mains come in from West University Avenue, both Anopheles and Culex larvae were found in considerable numbers. Many more of both kinds are breeding in the stagnant water that has collected in the bottom of the swimming pool. Culex in great numbers were found in the water pans in the poultry yard back of the kitchen. A few Culex were found in a trash can at the barracks. Culex by thousands were found in a barrel of fertilizer water back of the Experiment Station barn and also in a barrel half full of water near the mule stable. Considerable numbers were breeding in the watering tubs at the dairy and especially, as most of the faucets are dripping continually, in the pools that form on the ground around them. The cement watering troughs and wallowing basins in the hog yards close by contained numbers of wrigglers. On the other hand the three sinks, the small stream in the kitchen garden, and the effluent from the septic tank were all examined and no mosquitoes discovered in them. My observations coincide, in the main, with those reported by Loftin in recent numbers of THE FLORIDA BUGGIST, although he does record finding a few mosquito larvae in "marshes", "ditches" and "sphagnum swamps" where the moss and weeds form wet masses too dense for top minnows to penetrate. And I do not wish to be understood as meaning that mosquitoes do not commonly breed in natural as distinguished from artificial waters. I have many times found them breeding in numbers in the mountain bogs of

Oregon and the Rockies, in the prairie sloughs of Montana and the Dakotas, in the river sloughs and marshes of Wisconsin, and in the swamps of New England. It is thus with the greater surprise that I have found the natural surface waters of Florida so free from them. There is a valid biological reason for this in the fact that Florida waters are so abundantly stocked with natural enemies. Minnows swarm in sinks to all appearances entirely separated from other surface waters. Dragon- and damsel-flies, often called "mosquito hawks", are everywhere in Florida and their aquatic larvae, all carnivorous and active, voracious feeders, make short shrift of mosquito wrigglers in any pools that may be inaccessible to minnows. Then there are the water-bugs, water-scorpions, water-striders, water-boatmen and the whole series of predaceous water-beetles policing both surface and bottom of every pool, stream or lake margin. If man would consistently do his part, I am convinced that natural enemies would effectively do theirs in holding mosquitoes in check in Florida.

How can the people do their part? One home may breed mosquitoes to cover an area at least two hundred yards in diameter. How can we get every home, rich and poor, black and white, to do its share for its own comfort and safety and for that of the whole community? The solution of this problem means more to Florida socially, educationally and financially than possibly that of any other problem in the state. The statistics of our own State Board of Health give a death rate from malaria for 1919 of 41.8 per 100,000 of population; while for other states in the registration area the rate was only 3.2 (for 1917). We try, at least, to provide by law that every citizen shall learn to read and write. Of the two, in Florida, I should prefer to live next door to a man who could not read, if he knew how to prevent the breeding of mosquitoes on his premises, to living alongside of a university professor who didn't know and wouldn't learn enough to do this. Adequate and universally required science lessons in every grammar and high school in Florida offers the only practicable solution for the problem I can find. In what other way can we hope to reach every home?

Probably not one adult in ten has ever seen mosquito eggs, to know them, or has clear ideas about the life history of the insects. Every school child can be given this information in a single well developed science lesson. These lessons are clearly outlined in available books; but the pupils should collect and study the actual

specimens wherever possible. Every school child will then be able to *know* whether or not mosquitoes are breeding anywhere about the home.

The children should be provided with adequate equipment for this work. How many school children have insect nets? (Insect nets, inexpensive and easily made by the children themselves, for collecting in both water and air, were demonstrated.) Here is a weapon with which anyone can sweep up all the mosquitoes in a room in a few minutes. I have saved many a night's sleep with this simple device and have promised myself never to be without one in my future journeys in Florida. With our insect damage tax of over $1,500,000,000 annually every child ought to have and use the insect net during some part of every year of his school course.

Loftin, in the articles referred to, has described mosquito traps that may help in the solution of our problem. These traps are black or dark boxes or crocks set in favorable places about porches and are designed to take advantage of the instinct of mosquitoes to hide in dark holes during daylight, and considerable numbers might be trapped in this way. But we may be pardoned for asking whether the providing and daily tending of these traps might not entail more expense and labor than the entire work of doing away with the breeding places. These traps, too, seem to me to be lacking somewhat in definite attracting power. Are there not always too many other dark places in the dense foliage of trees, weed patches, vines and shrubbery—known to be the natural hiding places of mosquitoes? And could we hope by any arrangement of such traps to catch but comparatively few of the entire number about the premises?*

In making my experiments upon trapping stable flies I think I have caught at least as many mosquitoes in a single night in a single stable window trap as Loftin caught in all his traps in a year. Of course they happened to be there to catch that night, and no real comparison with the Loftin traps is intended. In this case a cow just inside the window supplied adequate attraction. In regions where extensive natural breeding places cannot be drained, filled or oiled, or stocked with fishes, such traps might readily be designed to catch all the mosquitoes that were attracted to house or stable windows, the occupants serving as "bait" but in no danger of being bitten. The traps would not be ex-

*As we understand it, Loftin's traps were intended only for use in closed rooms and exposed porches where natural hiding places for mosquitoes are few or absent.—Ed.

pensive and would catch bushels as easily as dozens, if they were there to catch. They would also be automatic and require no attention except to empty when full. Related as they would be to the one passion of a mosquito's life, the thirst for blood, if we could protect our domestic animals and ourselves with such traps during the hours when mosquitoes are active, we might save not only quantities of blood but catch practically all the breeding mosquitoes within flying distance. In general it is probably true that a mosquito does not produce eggs until she has drawn a meal of blood; so this method, if we could cover all the local sources of blood supply, might yield practical extermination. Quite possibly, too, differences in the mosquito attracting power of different animals might help in the good work. A cow, horse or mule might be found to attract practically all of the mosquitoes away from the wild birds, frogs and toads of a region. Of course these latter suggestions apply only to such places, if any exist in Florida, where extensive natural breeding waters are beyond present possibilities of control and should not be permitted to confuse or obscure the main point of this discussion. This is, that any community in northern Florida and the central part of the peninsula can completely rid itself of mosquitoes and malaria, at practically no expense, just as soon as it can secure the intelligent cooperation of every home in doing away with the strictly artificial and domestic breeding places of the pests. This does not apply to localities within flying distance for migratory species of either the Atlantic or Gulf coasts.

Beginning at home, the University campus should be made and kept absolutely free of mosquitoes. Then Gainesville might well be made a shining example and be in a position to tell other cities exactly how the work was accomplished.

The railroads are all bidding for tourists and settlers and if the attention of officials were called to this matter, orders from headquarters might quickly put a stop to mosquito breeding upon their property.

This is, of course, but a brief summary of the results of my first year's observations on the mosquito-malaria problem in Florida. I am fully convinced, however, that any farm home or community that acts on the above suggestions will be most agreeably surprised at the results. At any rate, will it not be good common sense to be absolutely sure that all the little domestic breeding places are attended to before undertaking expensive draining or oiling operations of swamps and ponds?

(See "Note", p. 14.)